

**coenzyme** Tightly bound small molecule or metal that is required for catalytic activity of some enzymes, often by forming a transient covalent bond to the substrate; also called *prosthetic group* or *cofactor*. Examples include pyridoxal phosphate. (See Figure 3-26.) See also coenzyme A, and NAD.

**coenzyme A (CoA)** See acetyl CoA.

**coiled coil** Stable rodlike quaternary protein structure formed by two or three  $\alpha$  helices interacting with each other along their length; commonly found in fibrous proteins and basic-zipper transcription factors. (See Figures 3-11d and 11-48g and h.) See also leucine zippers.

**collagen** A triple-helical protein that forms fibrils of great tensile strength; a major component of the extracellular matrix and connective tissues. The numerous collagen subtypes differ in their tissue distribution and the extracellular components and cell-surface proteins with which they associate. (See Table 24-1.)

**complement** A group of cytotoxic serum proteins involved in the mediation of immune responses. The complement cascade, a series of enzymatic reactions, is activated by antibody-antigen complexes or microbial cell walls and generates specific complement complexes that directly lyse microorganisms or infected cells or promote their phagocytosis.

**complementary** Referring to two nucleic acid sequences or strands that can form a perfect base-paired double helix with each other; also describing regions on two interacting molecules (e.g., an enzyme and its substrate) that fit together in a lock-and-key fashion.

**complementary DNA (cDNA)** See cDNA.

**complementation** In genetics, the restoration of a wild-type function (e.g., ability to grow on galactose) in diploid heterozygotes generated from haploids each of which carries a mutation in a different gene whose encoded protein is required for the same biochemical pathway. Complementation analysis of a set of mutants exhibiting the same mutant phenotype (e.g., inability to grow on galactose) can be used to determine if mutations are in the same or different genes. (See Figure 8-14.)

**conformation** The precise shape of a protein or other macromolecule in three dimensions resulting from the spatial location of the atoms in the molecule. The conformation of proteins is most commonly determined by x-ray crystallography. Small changes in the conformations of some proteins affects their activity considerably.

**consensus sequence** The nucleotides or amino acids most commonly found at each position in the sequences of related DNAs, RNAs, or proteins. See also homology.

**constitutive** Referring to cellular production of a molecule at a constant rate, which is not regulated by internal or external stimuli.

**constitutive mutant** (1) A mutant in which a protein is produced at a constant level, as if continuously induced; (2) a bacterial regulatory mutant in which an operon is transcribed in the absence of inducer. (3) A mutation in which a regulated enzyme is in a continuously active form.

**cooperativity** Property exhibited by some proteins with multiple ligand-binding sites whereby binding of one ligand molecule increases (positive cooperativity) or decreases (negative cooperativity) the binding affinity of successive ligand molecules. (See Figure 3-31.)

**cosmid** A type of cloning vector used to clone large DNA fragments. (See Figure 7-14.)

**cotransport** Protein-mediated transport of an ion or small molecule across a membrane against a concentration gradient driven by coupling to movement of a second molecule down its concentration gradient. See also antiport and symport.

**coupled reaction** Two linked chemical reactions in which the free energy released by one of the reactions is used to drive the other.

**covalent bond** A chemical force that holds the atoms in molecules together by sharing of one or more pairs of electrons. Such a bond has a strength of 50–200 kcal/mol. (See Table 2-1.)

**crossing over** Exchange of genetic material between nonsister chromatids of homologous chromosomes during meiosis to produce recombined chromosomes. (See Figure 5-55.) See also recombination.

**cyclic AMP (cAMP)** A second messenger, produced in response to hormonal stimulation of certain seven-spanning receptors, that activates cAMP-dependent protein kinase.

**cyclin** Any of several related proteins many of whose concentrations rise and fall during the course of the eukaryotic cell cycle. Cyclins form complexes with cyclin-dependent protein kinases, thereby activating and determining the substrate specificity of these crucial enzymes which regulate passage through the cell cycle.

**cyclin-dependent protein kinase (Cdk)** A protein kinase that is catalytically active only when bound to a cyclin. Various Cdk-cyclin complexes trigger progression through various stages of the eukaryotic cell cycle by phosphorylating specific target proteins. (See Figure 25-30.)

**cytochrome** Any of a group of colored, heme-containing proteins that transfer electrons during cellular respiration and photosynthesis. (See Figure 17-26.)

**cytokine** Any of numerous secreted, small proteins (e.g., interferons, interleukins) that bind to cell-surface receptors on certain cells to trigger their differentiation or proliferation. Some cytokines, also called *lymphokines*, function to regulate the intensity and duration of the immune response. (See Table 27-3.)

**cytokinesis** See cell division.

**cytoplasm** Viscous contents of a cell that are contained within the plasma membrane but, in eukaryotic cells, outside the nucleus. The part of the cytoplasm not contained in any organelle is called the cytosol.

**cytoskeleton** Network of fibrous elements, consisting of microtubules, actin microfilaments, and intermediate filaments, found in the cytoplasm of eukaryotic cells. The cytoskeleton provides structural support for the cell and permits directed movement of organelles, chromosomes, and the cell itself.

**cytosol** See cytoplasm.

**dalton** Unit of molecular mass approximately equal to the mass of a hydrogen atom ( $1.66 \times 10^{-24}$  g).

**dark reactions** All the reactions and processes that fix  $\text{CO}_2$  into sugar during photosynthesis; also called *Calvin cycle* and *carbon fixation*. These processes are indirectly dependent on the light reactions and occur both in the dark and light.

**degenerate** In reference to the genetic code, having more than one codon specifying a particular amino acid.

**denaturation** In proteins, disruption of various noncovalent bonds resulting in unfolding of the polypeptide chain; in nucleic acids, disruption of hydrogen bonds between nucleotides converting double-stranded molecules or portions of molecules into single-stranded ones. Heating or exposure to certain chemicals can cause denaturation, which usually results in loss of biological function.